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Android Based Wireless Controller for Military Robot in 360 Degree Border Safety

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Abstract: Nowadays, a lot of money is spent in the defence sector on implementing primitive security systems to protect the border from trespassers. Some military groups enlist the assistance of robots in high-risk regions where army soldiers are ineffective. These Army robots are disguised and equipped with a camera, sensors, land mine detectors, and a TV screen. Our system's main goal is to blend in, with some added features such as Wi-Fi for real-time data from the camera displayed on the video screen and an IR sensor to track intruders. As a result, the suggested Wi-Fi system eliminates defence blunders and keeps the country safe from the enemy. Some military groups enlist the assistance of robots in high-risk regions where army soldiers are ineffective. The camera, sensors, ground mine detection, and video screen are all contained into these Army robots.

Keywords: Camouflaged, intruders, land mine detections, IR Sensors

I.INTRODUCTION

A robot is a mechanical device that looks and acts like a human or animal. The majority of modern robots are controlled by a computer programme or electronic circuitry. Humans have been supplanted by robots in the performance of monotonous and risky duties. Essentially, Army Robots are capable of mobility, detection of dangerous gases, identification of individuals beneath the surface, and metal detection. Army Robot is a self-contained robot with a wireless camera that can be used as a spy. In comparison to soldiers, this Army robot is more efficient.

The major goal of the article is to develop a wireless multifunctional army robot based on camouflaged technology that can be operated via a smart phone via Wi-Fi. New technologies are being developed by science to make life easier for humans. Specialized robots in the field of Artificial Intelligence are an example of this technology's invention. The term "robot" refers to a machine that can "automatically carry out a complex set of activities, especially one that can be programmed by a computer." These robots make life considerably easier for humans, especially in hazardous environments and jobs. The military is one of today's major sources of concern. Military robots are specifically designed to perform dangerous tasks that are tough for humans to execute manually. These robots serve as a soldier's assistance. Due to their accuracy in performing jobs, several military organizations now use military robots to do dangerous tasks. These military robots are typically equipped with an integrated system that includes video screens, sensors, grippers, and cameras. Camouflage Robot's major goal is to reduce human casualties during military operations or terrorist attacks. Camouflage Robot serves as a virtual spy that may be dispatched to important military places for surveillance and fighting. The Camouflage robot can also be used to test the various security measures developed in the market and act as a measure to evaluate their efficacy because it is difficult to detect with the naked eye. The Camouflage Robot's primary goal is to improve the defence system's machinery. Working in the subject of zoology for wildlife photography is a secondary goal. The Camouflage Robot is inspired by the camouflage techniques used by chameleons. The goal of the project is to develop, construct, and run a robot using a PC as a remote control device, a small mobile robot that can copy the colours of the environment it goes through, allowing it to blend in with the environment. To accomplish these objectives, we used an RGB LED matrix that can spread consistent colours. The robot may initially conceal itself in red, green, and blue colours. Our robot's primary function is to disguise and pilot an object from afar, regardless of its size. As a result, in the defence sector, such a system would allow huge vehicles (e.g. armoured vehicles) to be considerably more camouflaged: fact, camouflage in the army has become crucial to army tasks, allowing soldiers to enter into enemy territory without being seen and protecting personnel from afar. In addition, spying robots such as drones could be used in the intelligence business. As a last example, using the principle of our robot, hidden picture or

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video systems in the field of wildlife photography would allow completely new shots. Finally, one of the Chameleon Robot's key advantages is that it is not only resistant to mild weather, but it is also environmentally friendly.

II.METHODOLOGY

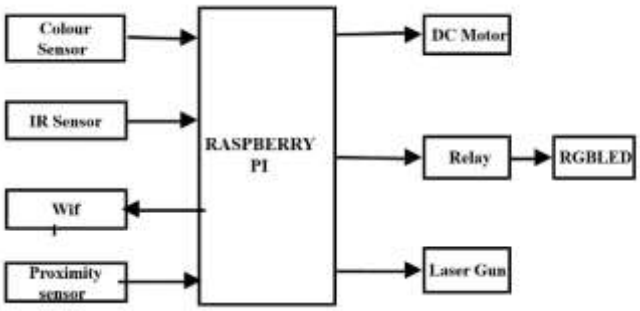
The Army Robot's concept is based on camouflage tactics. The goal of the project is to design, manufacture, and operate a Smart phone that, when used as a remote control device, can match the colour of the ground surface it will be travelling on, allowing it to blend in with the environment. On the one hand, we employed an RGB LED that can disperse uniform colours in conjunction with sensors that can precisely distinguish ground colours to achieve these objectives. This robot is built in such a way that it can replicate colour independently in different places, with each area being able to reproduce colour with certain points on the ground surface, allowing the robot to mimic a checkerboard of several colours — the various hues it drives over. On the other hand, we developed a system that can receive and decipher information from a smart phone via IoT and then use it to control motors that drive the robot in any desired direction. When the primary robot goes beyond the IOT range, we have another implementation in this module that allows us to control one robot from another utilising wireless communication. We are utilising ZIGBEE to establish communication between the two robots for this task.

The goal is to create a smart surveillance system that can be monitored remotely by the owner using an Android app. Because it is connected to the system via IOT, when an incursion is detected within the room, the system will send a push notice to the android mobile. For remote security monitoring, it is necessary to build and implement a low-cost web-camera-based surveillance system. Authorized users can use a mobile phone to access their monitoring system remotely through the internet and check the situation on the app. The entire project is run on a Raspberry Pi running the Raspbian operating system. The Surveillance System is divided into two parts:

Hard-wired surveillance systems: These systems use wires to connect the cameras, motion detectors, power supply and LAN cable with the pi.

Remote Access Systems: These systems have the capability to monitor and control a security system from a location away from the surveillance area through android device.
This technology will keep an online record of all the potholes that have gotten in the way of the car equipped with it. The road repair crew will be able to locate these problematic roads with the use of this pothole registry. This may make maintenance work go more quickly. The driver of the vehicle will be able to avoid the pothole using this system since he or she will receive an alarm 10 seconds before the pothole when the vehicle speed is medium, i.e. 30 kmph. If the vehicle's speed is lower, the alarm time will be shorter, and vice versa. The suggested system's architecture is made up of three parts: a sensor unit, a server unit, and a user unit.

III.IMPLEMENTATION



A. Land mine Detection:

Landmine removal is a major issue in many nations throughout the world, and natural disasters and land development can exacerbate the matter. As a result, detecting landmines in the ground and securely removing them is a pressing concern. The discovery of landmines in the ground is the first step in the landmine removal process. Non-touch detection technologies are essential for safe detection. Non-touch-based sensors, such as metal detectors and radars, are used to

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identify landmines in the signals they produce. Due to their benefits over other sensors, ground penetrating radars, or GPRs, are an appealing solution for landmine detection. The GPR can be used as a standalone sensor or in conjunction with a metal detector as a supplementary sensor. Both metal and nonmetal landmines can be detected by it. It can also be made light in weight so that it can be used in a hand-held system or a vehicle-mounted system as an array of several antenna elements. Landmine identification, which is a process of identifying the types of landmines and their burial depths, may follow the landmine detection stage. This extra information will aid in the detection and removal of landmines. Identification entails more stages than detection, and thus has received little attention in the associated discipline.

The topic of landmine detection and identification using GPRs is addressed in this paper, and a unique approach of detection and identification based on numerous features is proposed. Eigenvalues and Fourier coefficients are obtained using principal component analysis and Fourier Transform, respectively, and are utilized as features associated with each landmine. Algorithms for detecting and identifying objects with many features are described and tested using a variety of instances.

B. ROVER MOVEMENT

The Raspberry Pi is utilized in two different ways. The rover is controlled manually from a distant device via a web server connected to the internet in the Remote Control mode. This is done when the Raspberry Pi sends a signal to the rover, and the rover's movement is controlled by the master. The robot's movement is controlled by keys in all four directions, as well as the web server's start and stop functions. The rover is programmed using the Raspberry Pi in autonomous mode, while the ultrasonic sensor detects any obstacles and changes its route accordingly.

The most common form of motor is a direct current (DC) motor. In most DC motors, there are only two leads: one positive and one negative. The motor will rotate if these two leads are connected directly to a battery. The motor will rotate in the other direction if the leads are switched. A circuit known as an H-Bridge can be used to adjust the direction of a DC motor's spin without changing the way the leads are connected.

C. CAPTURING IMAGE

A webcam is a video camera that transmits images to a computer or computer network in real time, usually by USB, Ethernet, or Wi-Fi. The most common application is the creation of video connections, which allows computers to function as videophones or video conference stations. The webcam got its name from its widespread use as a video camera for the World Wide Web. Security surveillance and computer vision are two more popular applications. Webcams are the most affordable kind of video communication due to their low manufacturing costs and adaptability. Because certain built-in webcams may be remotely activated via spyware, they've also become a source of security and privacy concerns. A frame rate greater than or equal to 80fps is required to shoot pictures in 0.025s with picamera. The rationale for requiring 80fps rather than 40fps (assuming that 1/0.025=40) is that there is currently an issue with the multi-image encoder that causes every other frame to be skipped, resulting in an effective capture rate of half the camera's framerate. Later firmware versions of the Pi's camera module support 80 frames per second (see camera modes in the picamera docs), but only at VGA resolution (requests for higher resolutions with framerates >30 frames per second will result in upscaling from VGA to the requested resolution, so this is a limitation you'd face even at 40 frames per second). SD card speed constraints are another issue you'll almost certainly face. To put it another way, you'll almost certainly need to capture to a faster medium, such as a network port or in-memory streams (assuming all the images you need to capture will fit in RAM).

The previous notion of an Automatic Gun Targeting System was to use automation to identify and target living objects or any movement in a highly guarded region such as a border. The automation is based on a sensor-based automated pistol targeting system that targets living objects within the sensor's range. PIR sensors, a camera, and a microprocessor are used to automate gun targeting. Until then, the border is guarded by Iron Spike wires and a watchtower from which a person flashes a light over the border region at all hours of the day and night. Those individuals bear sole responsibility for border security.

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This system is designed to track an object in real time and provide security through the use of peripherals. The system's operation is divided into various parts, one of which is the processing of video signals from the camera. After converting the video to a raw digital format, the brightness portion is retrieved using image processing methods. Then, in order to detect motion in the current frame, each frame is compared to the prior frame. The background subtraction approach is used to accomplish this. We used scaling and smoothing techniques to reduce noise and increase the image's sharpness in this project. The difference image was then calculated by subtracting the background information. Then, employing morphological processes, the raw binary image is further processed, resulting in the detection of several objects. After that, we used blob analysis to connect all of the recognised image's pieces. The next stage was to determine the coordinates of the chosen target, which was accomplished by transmitting the data to a microcontroller-based device that compared the current frame's coordinates to those of the preceding frame. The microcontroller then does two tasks: one, it activates peripheral devices, and the other, it makes a choice to move the gun to the appropriate place. The microprocessor uses the stepper motor to regulate the movement of the pistol once the target has been chosen. Following the tracking of the item, the decision to shoot the target is made manually or automatically using a microcontroller.

IV.RESULTS

We employed an RGB LED matrix to disperse consistent colours, as well as sensors to accurately discern ground colours. This robot is built in such a way that it can recreate colour in multiple places independently, with each area able to duplicate colour with specified spots on the ground surface. On the other hand, we developed a system that can use Blue-tooth to receive and parse information from a smart phone, which is then used to control motors that propel the robot in any desired direction. In addition, a camera is attached to display real-time data wirelessly through RF, a gas sensor to detect toxic gas, a metal sensor to detect metal arms and weapons, a PIR sensor to detect human invaders or soldiers beneath the soil, and an LCD display to display the discovered parameter.

A power supply's principal job is to convert electric current from a source to the proper voltage, current, and frequency for powering a load. Power supplies are sometimes referred to as electric power converters as a result of this. Some power supplies are stand-alone devices, while others are integrated into the load appliances they support. Power supply seen in desktop computers and consumer electronics devices are examples of the latter. Other functions of power supplies include limiting the current drawn by the load to safe levels, shutting off the current in the event of an electrical fault, power conditioning to prevent electronic noise or voltage surges on the input from reaching the load, power-factor correction, and storing energy so that it can continue to power the load in the event of a temporary interruption in the power supply.

An infrared sensor can detect motion as well as measure the heat of an item. This sort of sensor, also known as a passive IR sensor, measures solely infrared radiation rather than emitting it. Almost all items emit some type of thermal radiation in the infrared range.

Many relays use an electromagnet to mechanically activate a switch, however solid-state relays and other operating principles are also used. Relays are employed when a distinct low-power signal is required to control a circuit, or when multiple circuits must be controlled by a single signal.

The speed of a DC motor can be varied across a large range by varying the supply voltage or adjusting the current intensity in the field windings. Tools, toys, and appliances all employ small DC motors.

USB cameras are imaging cameras that transfer image data using USB 2.0 or USB 3.0 technology. USB cameras use the same USB technology that is present on most laptops to connect to specialized computer systems. A camera is an optical device that captures still images or records moving images and stores them on a tangible media like a digital system or photographic film.

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Electric power systems work by sending power from a utility source, which is then routed through an electric switchboard. The electricity is subsequently relayed over a number of circuits by the switchboard. The power is subsequently transferred to feeders, which are ultimately dispersed to destinations throughout the power grid's reach. An electric switchboard is a device that distributes power from one electrical source to another. It is an important part of the electricity distribution process.

Spatial coherence also enables laser pointers and lidar by allowing a laser beam to remain narrow across long distances (collimation). Lasers can also have a high temporal coherence, allowing them to emit light with a very narrow spectrum, or a single colour.

CONCLUSION

The proposed system is a human life substitute. Because human life is always more important, the proposed robot can serve as a security system as well as a lifesaver. It enacts and performs a crucial part in keeping an eye on the battlegrounds and capturing the surrounding territories. Because it is based on the Chameleon's colour changing effect, the robot changes colour in response to its surroundings and is hidden from the enemy's view. Communication between robots allows for functioning outside of the coverage region. Furthermore, the camouflaging characteristic makes it impossible for the naked human eye to spot the robot. As a result, the proposed method assists our security officers in the detection of intruders. The robot can also be utilized in locations where humans cannot survive, such as high altitudes.

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